Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1-6. (Cancelled)

7. (Currently amended) An exponential conversion circuit comprising:

a first voltage conversion circuit for converting first and second reference voltages to first and second differential output voltages, respectively, on the basis of a first gain control signal;

a first exponential conversion device for creating [[the]] a first output current which changes exponentially with respect to the first differential output voltage;

a second exponential conversion device for creating a second output current which changes exponentially with respect to the second differential output voltage;

a first current comparison circuit for changing the first gain control signal in accordance with the ratio of the first and second output currents;

a second voltage conversion circuit for converting a third reference input voltage and the first reference input voltage to [[the]] third and fourth differential output voltages, respectively, on the basis of [[the]] a second gain control signal;

a third exponential conversion device for creating a third output current which changes exponentially with respect to the third differential output voltage;

a fourth exponential conversion device for creating a fourth output current which changes exponentially with respect to the fourth differential output voltage;

a second current comparison circuit for changing the second gain control signal in accordance with the ratio of the third and fourth output currents;

a third voltage conversion circuit for converting the second reference input voltage and the third reference input voltage to fifth and sixth differential output voltages, respectively, on the basis of [[the]] a third gain control signal;

a voltage comparison circuit for creating the third gain control signal in accordance with the ratio of the fifth or sixth differential output voltage as against the second gain control signal;

a fourth voltage conversion circuit for converting a control input voltage and the first reference input voltage to [[the]] seventh and eighth differential output voltages, respectively, on the basis of the third gain control signal;

a fifth voltage conversion circuit for converting the control input voltage and the first reference input voltage to a ninth differential output voltage on the basis of a fourth gain control signal; and

a fifth exponential conversion device for creating a fifth output current which changes exponentially with respect to the ninth differential output voltage;

wherein one of the seventh and eighth differential output voltages becomes the fourth gain control signal to change the fifth output current ~~linearly and~~ exponentially with respect to the control input voltage.

8. (Currently amended) The exponential conversion circuit according to claim 7, wherein the first, second, third and fourth voltage conversion circuits have a common mode detection circuit and a common mode feedback circuit~~, respectively~~.

9. (Original) The exponential conversion circuit according to claim 8, wherein the first gain control signal is input to the common mode feedback circuit in the third and fourth voltage conversion circuits.

10. (Currently amended) The exponential conversion circuit according to claim 7, wherein the first, second, third, fourth and fifth exponential conversion devices comprise~~, respectively,~~ electric field effect transistors which are operated in a weak inversion area.

11. (currently amended) The exponential conversion circuit according to claim 7, wherein the first, second, third, fourth, and fifth exponential conversion devices comprise~~, respectively,~~ bipolar transistors.

12. (Currently amended) A variable gain circuit comprising:

an exponential conversion circuit ~~according to claim 7; and~~ comprising:

a first voltage conversion circuit for converting first and second reference voltages to first and second differential output voltages, respectively, on the basis of a first gain control signal;

a first exponential conversion device for creating a first output current which changes exponentially with respect to the first differential output voltage;

a second exponential conversion device for creating a second output current which changes exponentially with respect to the second differential output voltage;

a first current comparison circuit for changing the first gain control signal in accordance with the ratio of the first and second output currents;

a second voltage conversion circuit for converting a third reference input voltage and the first reference input voltage to third and fourth differential output voltages, respectively, on the basis of a second gain control signal;

a third exponential conversion device for creating a third output current which changes exponentially with respect to the third differential output voltage;

a fourth exponential conversion device for creating a fourth output current which changes exponentially with respect to the fourth differential output voltage;

a second current comparison circuit for changing the second gain control signal in accordance with the ratio of the third and fourth output currents;

a third voltage conversion circuit for converting the second reference input voltage and the third reference input voltage to fifth and sixth differential output voltages, respectively, on the basis of a third gain control signal;

a voltage comparison circuit for creating the third gain control signal in accordance with the ratio of the fifth or sixth differential output voltage as against the second gain control signal;

a fourth voltage conversion circuit for converting a control input voltage and the first reference input voltage to seventh and eighth differential output voltages, respectively, on the basis of the third gain control signal;

a fifth voltage conversion circuit for converting the control input voltage and the first reference input voltage to a ninth differential output voltage on the basis of a fourth gain control signal; and

a fifth exponential conversion device for creating a fifth output current which changes exponentially with respect to the ninth differential output voltage;

wherein one of the seventh and eighth differential output voltages becomes the fourth gain control signal to change the fifth output current exponentially with respect to the control input voltage; and

a plurality of variable gain amplifiers connected in series wherein a gain of each of the plurality of variable gain amplifiers is controlled with the fifth output current of the exponential conversion circuit ~~according to claim 7~~.

13-21. (Cancelled)